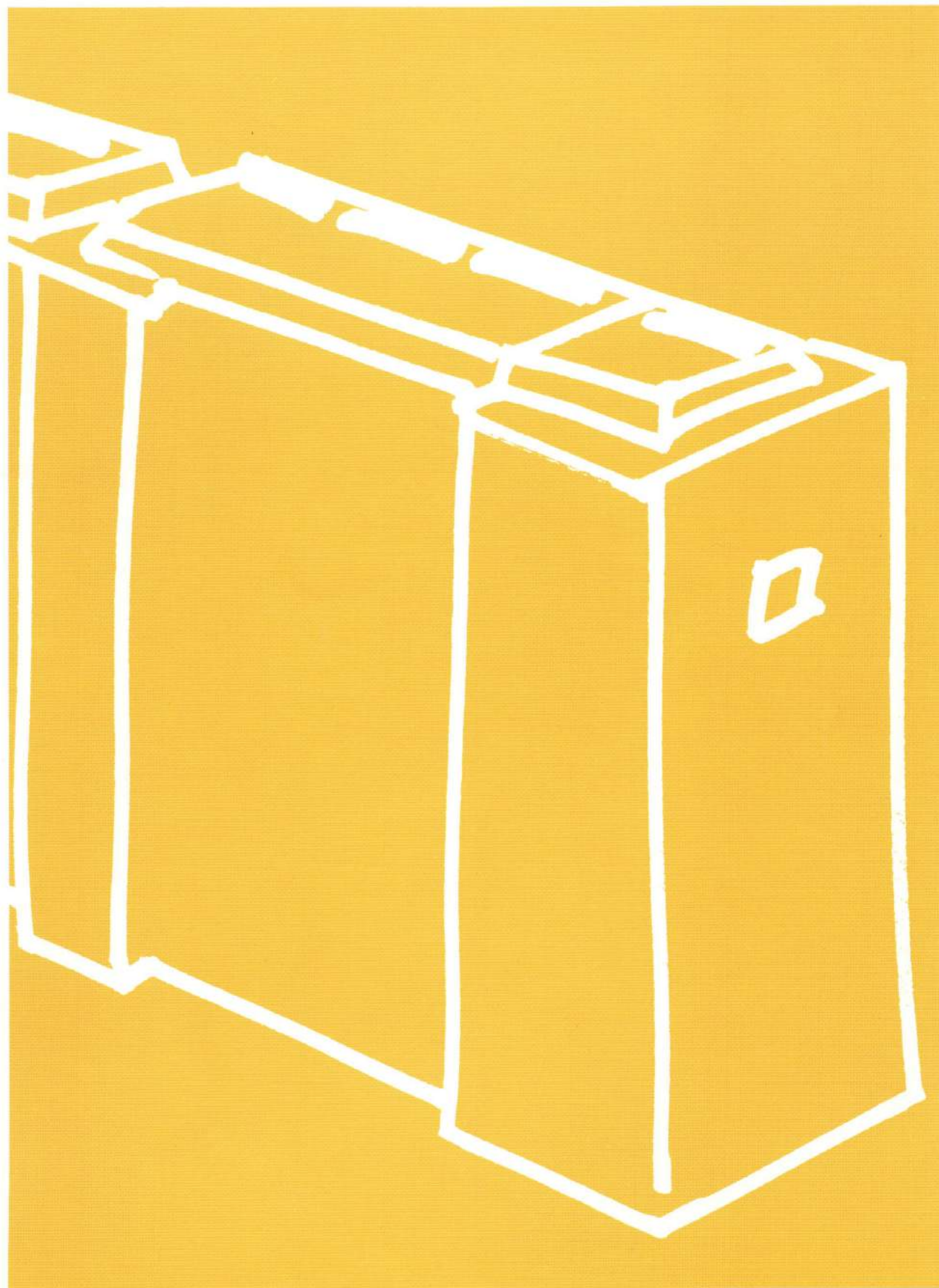


IBM 3081 Processor Complex

IBM



IBM 3081 Processor Complex

The IBM 3081 Processor Complex is a fully compatible addition to IBM's range of 303X processors.

Through the use of a dyadic processor design and innovative circuit packaging technology, it offers users a new level of performance, with savings in space, power, and cooling.

Compared with the IBM 3033-U, the 3081 can be up to 2.1 times faster, yet:

- occupies less floor area*
- consumes under half the power*
- dissipates under half the heat.*

Other benefits made available by the new technology to IBM 3081 users stem from:

- computer-controlled integration of production methods and testing procedures*
- drastically reduced number of physical parts, cables, and pin-to-wire connections*
- a greater degree of automatic error detection and correction, with remote servicing possibilities*
- automatic identification by code of a failing item, and large-scale use of function-oriented assemblies.*

These are just a few of the design highlights that help to give the IBM 3081 leading status among high-performance data processing systems. They can also be your means to increase throughput, improve system response, and combat rising overheads and running costs.

A balanced design - new potential online

In the IBM 3081, performance gains are largely due to its unique balanced design of technology, principal components (such as channels, processors, and storage), and operating software. The end result is a system with the capacity and throughput capability to support

better the extensive online applications now necessary in the complex world of modern business.

Additional performance throughout your organisation

There are many ways in which you can exploit the high throughput capability of the IBM 3081 to enhance your current data processing activities and improve the level of service to all your end users. For example, by operating the IBM 3081 with your existing, compatible IBM systems you can:

- off-load onto the 3081 those applications that need a faster response*
- catch up on application back-log*
- extend multiple processor activities*
- provide additional back-up capability*

Any of these methods, and many more, can have the immediate benefit of allowing those users on the IBM 3081 to work more effectively. They can also allow you to capitalise on your original resource investment by making available on your previously installed systems additional processing power for application enhancements.

By installing the IBM 3081 today you will be introducing a new technology that can be the foundation for your data processing centre of the future.





IBM 3087 Coolant Distribution Unit

IBM 3089 Power Unit

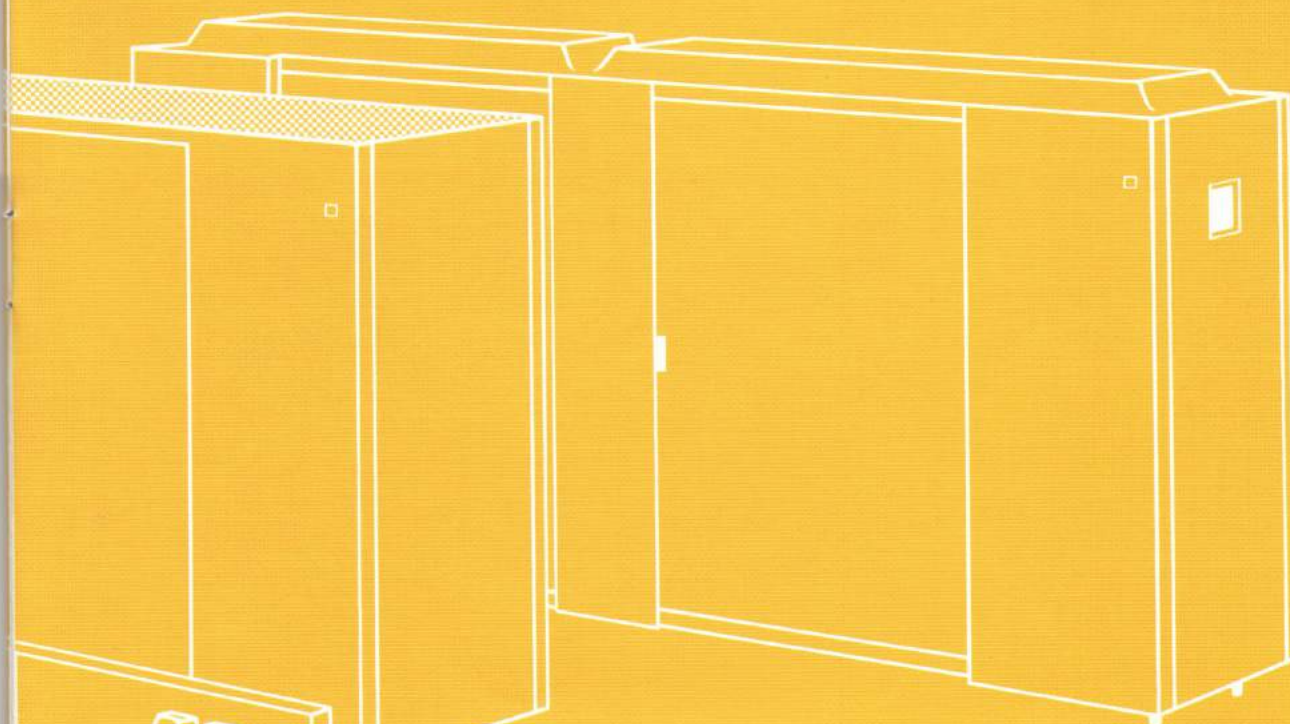
*IBM 3287 Printer
and 3278
Display Station*



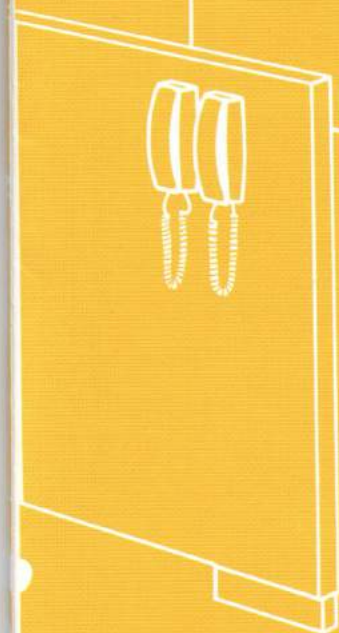
IBM 3279 Colour

IBM 3274 Control Units

IBM 3081 Processor Unit



IBM 3082 Processor Controller



Display Terminals

Few, compact units

In most data processing centres, space is at a premium. This is where the compact, space-saving design of the IBM 3081 makes it easier for you to obtain the extra performance you need. If the relatively small size of the IBM 3081 is primarily the result of the new high-density packaging technology, it is other design details, such as new roll-back doors (which reduce the service area and improve accessibility) that may make the difference when you are short of floor space.

In addition, there are few units to install:

- IBM 3081 Processor Unit*
 - IBM 3082 Processor Controller*
 - IBM 3087 Coolant Distribution Unit*
 - IBM 3089 Power Unit*
- plus system and operator consoles.*

IBM 3081 Processor Unit

The 3081 Processor Unit has:

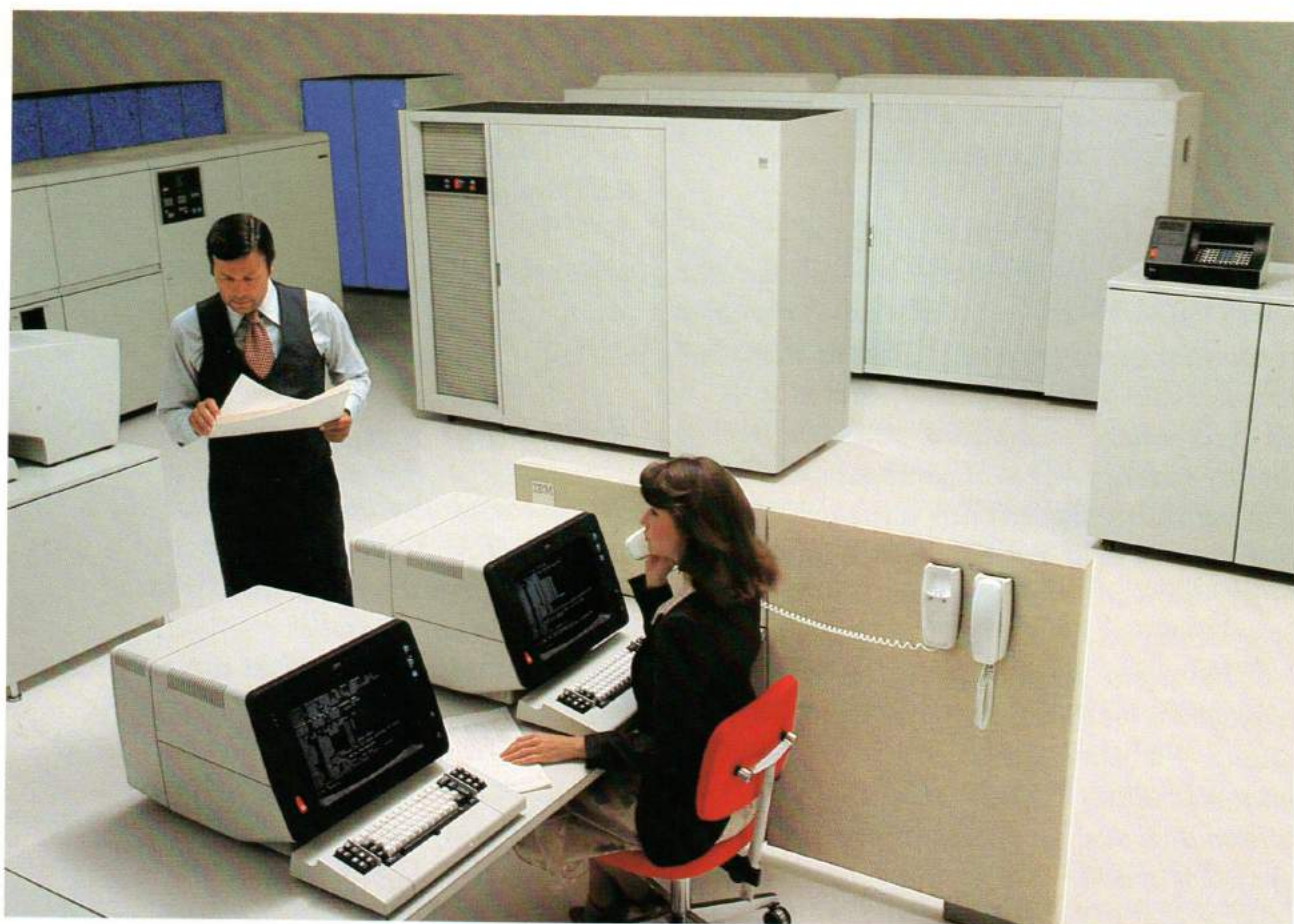
- a basic central storage capacity of 16 megabytes, which can be optionally increased to 24 or 32 Mb*
- up to 24 channels, of which 16 are basic and 8 are optional. They can all be block multiplexer channels, each one being capable of supporting data streaming and transferring data at up to 3 Mb/second. Up to four of the basic 16 channels could be assigned to be byte multiplexer channels*
- a dyadic processor consisting of two integrated central processors, sharing the same central storage and operating under a single control program. Each processor has a 32 Kb buffer to help improve central storage access time, and its own set of channels. The maximum number of channels per set is 16. Channel interaction with central storage is direct, bypassing the buffers.*

The integrated design of the central processors combined with the capability of the 3081 to switch a channel set from one central processor to the other offers new availability advantages. If one central processor should fail, its channel set can be accessed via channel set switching by the remaining central processor. Processing can, therefore, continue until a suitable time can be allocated for maintenance. Similar deferred maintenance possibilities exist for other functional elements of the 3081 Processor Unit.

IBM 3082 Processor Controller

The 3082 Processor Controller plays an essential role in supervising, controlling, and maintaining the 3081 Processor Complex. Through greater automation of error detection and correction, and identification of failing parts, it extends the monitored environment concept introduced earlier on IBM's large systems.

To supervise and control 3081 operation, the 3082 carries out unit initialisation,



establishes and keeps the elements available for use by the processor unit, distributes microcode loads, provides the control unit function for the system console, and assists in hardware error recovery.

As an advanced maintenance and diagnostic unit, the 3082 controls an integrated service support console, provides communications support for access to remote service locations, monitors and logs intermittent failures, analyses failure mechanisms, and identifies directly failing parts to allow rapid and effective intervention. Where a teleprocessing link does not exist, error log information can be physically transferred for analysis via a system diskette.

The service support console can also be used to replace a malfunctioning system or operator console. An optional IBM 3287 Printer can be attached to print hardcopy snapshots of information displayed on the service support or system console.

IBM 3087 Coolant Distribution Unit

The 3087 Coolant Distribution Unit is functionally supervised by the Processor Controller to supply cooling water at the appropriate temperature and flow rate in a closed loop to maintain the 3081 Processor Unit at its optimal operating temperature.

IBM 3089 Power Unit

Connected to your mainline supply, the optional 3089 Power Unit is designed to provide a stabilised ac power source to all units of the 3081 Processor Complex. Its low noise level allows it to be installed in your data processing centre.

System and operator consoles

System console functions are provided by a table-top IBM 3278 Display Console Model 2A, which connects directly to the 3082 Processor Controller.

Operator console facilities can be provided by normal end-user terminals, such as the proven 3278 Display Station and the newly introduced IBM 3279 Colour Display Terminal. They connect to the 3081 Processor Unit via IBM 3274 Control Units.

The system and operator consoles can be connected at up to 1500 cable metres (4920 feet) from the processor unit. In consequence, you have a better opportunity to construct a master control centre appropriate to your particular site layout. In addition, optional accessory tables, with space for two terminals, are available. They are designed to provide out-of-sight cable routing for displays and telephones. One version incorporates a bulletin-board-like end partition for the posting of new procedures, messages, schedules, and charts.



The Thermal Conduction Module - a new, improved way to package chips

The driving force behind the IBM 3081 evolution in processor design is the Thermal Conduction Module (TCM).

It is the result of several years of systematic research for new, improved techniques for interconnecting, powering, and cooling high-circuit density silicon chips to exploit better their inherent performance capabilities.

Essentially, TCM technology allows chips to be packed closer together than previously possible, and in greater numbers: 100 or more on a surface approximately 9 centimetres (3.5 inches) square. In total, more than 45,000 circuits, the equivalent of an IBM System/370 Model 145.

TCM technology enables shorter signal paths, the inclusion of all the circuits for one or more system functions within a single, pluggable assembly, and the expanded use of computer control of manufacturing processes. Consequently, it can:

- increase overall system performance*
- support a system design with additional function*
- improve the level of testing during manufacture*
- allow more effective troubleshooting and servicing.*

The sum total is a design concept that is in the forefront of computer technology.

Connections in three dimensions

One of the key elements of the TCM technology is the substrate on which the chips are directly mounted.

It consists of 33 ceramic layers, the surface of each one being covered by a maze-like pattern of very fine lines deposited by molybdenum metallisation. The lines are interconnected vertically to form three-dimensional electrical paths to carry power and signals between 1800 pins on the undersurface of the substrate and the chips on the upper surface. To manufacture the substrate, a new technology is used to process the ceramic and metal simultaneously, giving a single, fused, multilayered assembly, with the following advantages:

- elimination of many thousands of low-reliability, pin-to-wire connections. The sixteen layers that provide signal interconnection, for example, collectively contain the equivalent of 6000 wires*
- higher density packing of chips for a more function-oriented design. Depending on the function to be performed, 100- or 118-chip TCMs are used*
- considerably shorter distances that signals have to travel*
- greatly reduced chance to induce errors from handling exposed parts and discrete wires.*

Enhancements in testing and diagnostics

As well as exploiting chip capabilities better, the new interconnection technology allows testing and diagnostics to be enhanced. For example, logic in the TCM allows each chip to be tested independently of other chips on the substrate, both during the manufacturing process and after installation of the 3081 complex in your data processing centre. It brings three main advantages:

- reduces untestable logic in the TCM to less than 1 per cent, compared with 15 per cent on assembled logic cards*
- simplifies test patterns*
- provides for high test coverage in remotely controlled diagnostics.*

Improved cooling and better environmental protection

Covering the mounted chips and the substrate is a metal cap that makes the TCM a hermetically sealed unit. The cap contains spring-loaded pistons that are in contact with every chip on the substrate, and the cavity between the substrate surface and the inside of the cap is filled with inert helium gas. The pistons and helium thus provide a very low thermal resistance path between the mounted chips and the cap exterior.

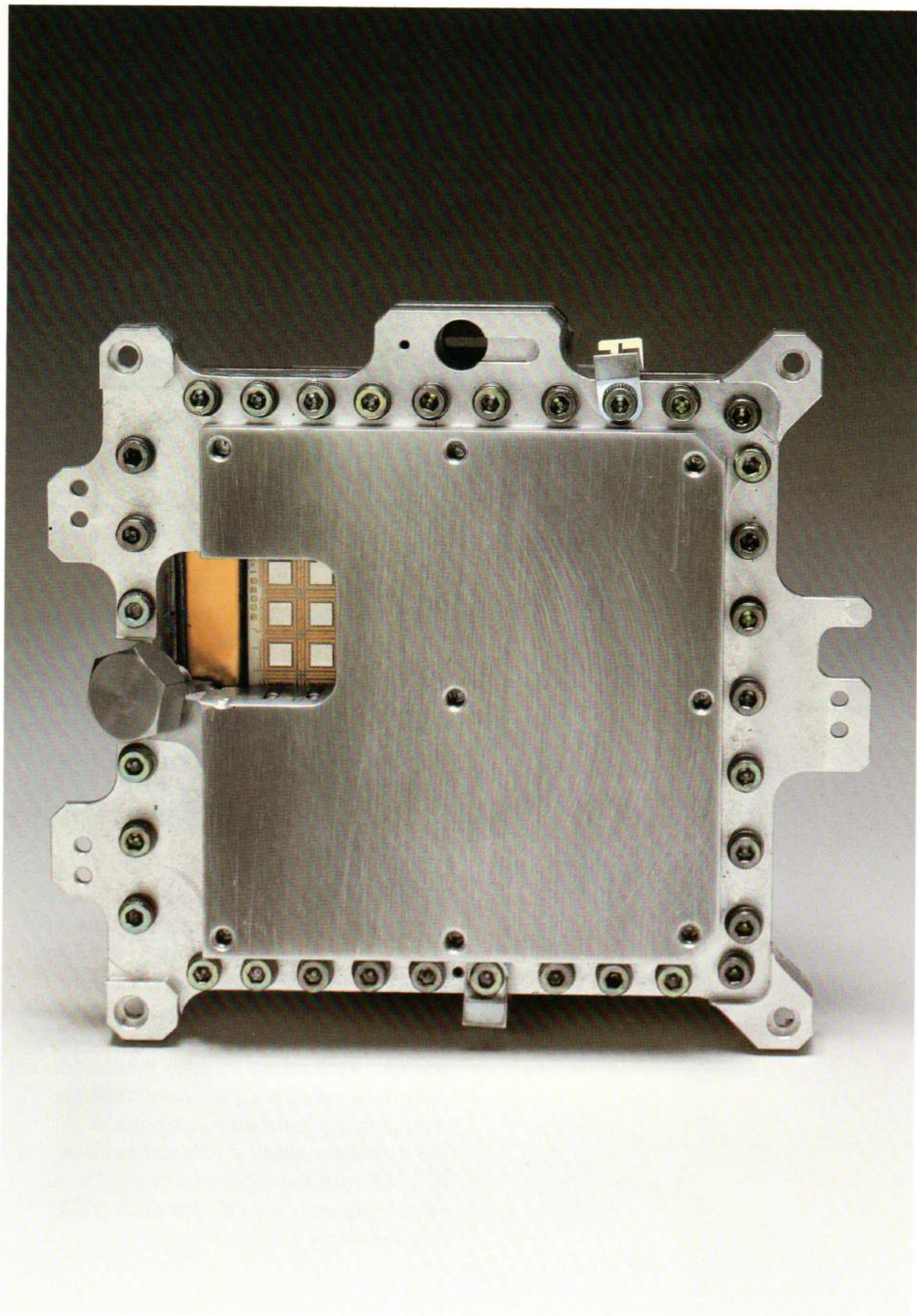
The cap and helium are also designed to protect the chips against physical damage and chemical contamination.

More effective functional packaging

In the 3081 Processor Unit, separate chilled-water cooling plates are in contact with the TCM caps, and the coolant distribution unit continuously monitors the water flowing through the plates to ensure a close control of the operating temperature.

The efficient cooling system and the improved cooling capability of the TCM technology have meant that high-performance chips, such as storage array chips, can be intermixed more freely with logic chips. The greater level of storage and logic integration thus obtained:

- aids the cycle time of the processor*
- improves communication between logic and local storage*
- permits more extensive use of local storage associated with logic, enabling certain functions*



previously carried out by logic to be migrated to microcode.

In addition, because arrays are more closely packed, signal paths are much shorter. Wire propagation time is held to a minimum, allowing functions to be accommodated within one cycle, instead of over longer periods. This adds up to more functions in less time, and the means to achieve a higher level of performance.

New matching technology for the TCM boards

The TCMs plug into boards consisting of 20 power and signal layers, thus using a design similar to that of the TCM substrate. Power and signals pass between the board and TCM via the 1800 pins on the underside of the substrate. Communication between the boards and other elements in the 3081 is via new, specially designed cables and connectors that plug into the board surrounds.

A directly visible effect of the TCM/board design is the neat and almost cableless interior of the 3081 Processor Unit.

For example, not one cable has been used to interconnect the circuits of the TCMs plugged into the boards. The six signal layers of a board contain approximately 3500 wires, and on a nine-position TCM board there can be collected together nearly a quarter of a million logic circuits plus one half million bits of storage.

In the 3081 Processor Unit, only 6 per cent of connections are made by cables and wires. With far fewer wires to be routed and shielded properly to avoid noise problems, the possibility of random system malfunctions is significantly reduced.

Easily pluggable

Coincident with the development of the new TCM technology was that of a new connector system designed to allow TCMs to be plugged into and out of the boards easily. The new connector allows a TCM to be aligned with its board location, then be gradually cammed into position. At this time, all 1800 module pins are brought into good physical contact with the corresponding board pins. A repeatable low-resistance contact is achieved by the design in which each board pin adjusts itself to the module pin and clasps the pin as the TCM is cammed into position.

Designed for high utilisation

From the conception of the TCM itself, through the board multilayer structure, to the dyadic processor, the 3081 Processor Complex has been designed to offer you a high level of utilisation and productivity. Among its most important features are:

- Checkpoint retry.*
- Error checking and correction hardware designed to automatically correct single-bit errors and detect double-bit errors in central storage.*
- Extensive hardware error recovery and repair features provided by the processor controller.*
- The number of system interruptions reduced.*
- The service support console allows many maintenance tasks to be carried out in parallel with normal system operation.*
- Identification by the processor controller of a failing component, and the logging of the part replaced to provide an up-to-date system history log.*
- Capability for communications connection to IBM remote servicing locations.*
- Update of diagnostic aids via system diskette.*
- Allows your system to benefit from experience being obtained world-wide.*

Software support

The 3081 Processor Complex operates under System /370 compatible MVS/System Product and VM/System Product. The performance under MVS/SP is significantly enhanced by the hardware and microcode functions provided by the 3033 Extension Feature, which is included as basic in the 3081 Processor Unit. Similarly, for VM users, Virtual Machine Assist is included as basic.

Balanced design, balanced configuration - optimal performance

In designing the 3081 Processor Complex great attention has been given to achieving the proper balance between the technologies and the principal components, such as channels, central processors, and central storage.

Ideally, therefore, this balanced design concept should also be applied when configuring a total system with I/O and communications devices and software.

For example, care should be taken to achieve the correct storage hierarchy. This is seen in the 3081 complex as the high-speed storage buffers and central storage plus the appropriate type and capacity of direct access storage devices and matching control units.

While it is unlikely that a standard system configuration exists to meet all user needs, the following recently announced and complementary IBM products can offer you the configuration flexibility necessary to create with the 3081 complex a balanced total system:

- IBM 3380 Direct Access Storage, which provides 2520 megabytes of storage per unit, has a 16 millisecond access time, and transfers data at 3 megabytes per second. It features the proven reliability of fixed media, the film head technology introduced with the IBM 3370 DASD, and a new double controller function designed to improve data availability for users. Other benefits stem from reductions in storage costs, power consumption, floor space, and heat output.

- IBM 3880 Storage Control, which allows you to access large amounts of online storage, mix a wide range of DASD on the same system, and create extensive multiple processor environments. It features two separate storage directors, to each of which can be connected up to 32 DASD actuators. Up to eight channels can be connected per director. It supports data streaming, and can transfer data at up to 3 Mb/second on each channel.

- IBM 3814 Switching Management System, which provides electronically controlled reconfiguration capability to help manage large data processing installations. It has a maximum size of 128 nodes. It aids in simplifying system operations by allowing up to 78 pre-defined configurations, remote and/or local control, and remote power on/off sequencing of I/O control units, including the IBM 3880.

A final round-up

This then is the IBM 3081 Processor Complex - an evolution in large system design, offering you more performance in less space.

By maintaining compatibility with System/370 software and peripheral devices, the 3081 can give you the opportunity to enhance your present installation and extend the effect of its high throughput capability throughout all your data processing activities.

But above all, the new technology of the 3081 can provide you with the foundation for future growth.

Let's recall some of its principal characteristics:

- Dyadic processor (two integrated central processors)*
- 32 Kb of buffer storage per central processor*
- 16, 24, or 32 megabytes of central storage*
- 16 or 24 integrated block multiplexer channels (up to four byte multiplexer channels can replace an equivalent number of block multiplexer channels)*
- MVS/SP and VM/SP support.*

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IBM World Trade
Americas / Far East Corporation
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Route 9, North Tarrytown
New York, 10591, USA

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